



East and West Cliffhouse – Montezuma Canyon, Utah

DRUM PROGRAM MIDYEAR PROGRESS REPORT

January 1-June 30

2021

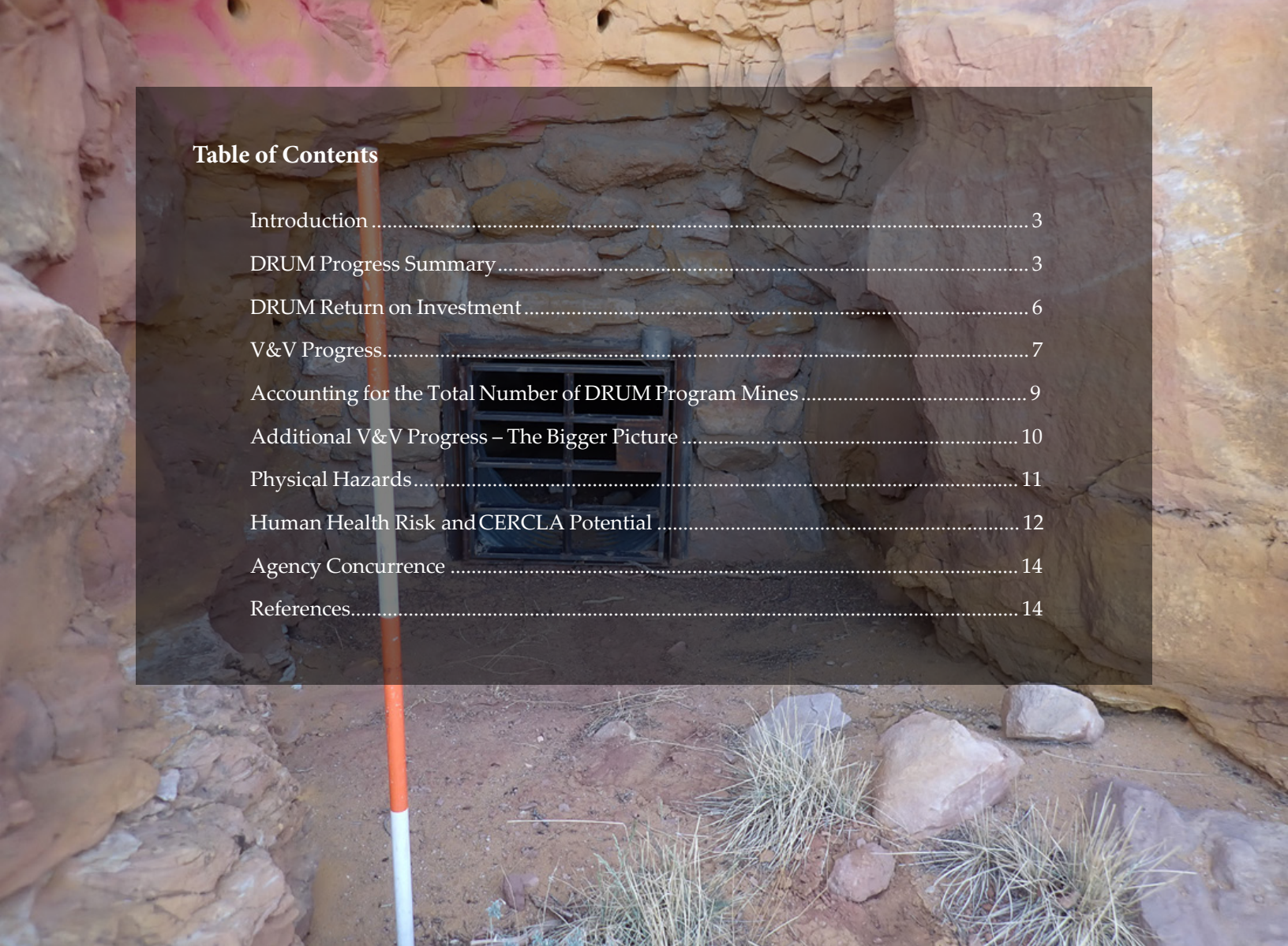


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Introduction

The *Defense-Related Uranium Mines Report to Congress* (DOE 2014a) (Report to Congress) identified potential physical and environmental risk of specific legacy abandoned uranium mines in the United States. This set of mines provided uranium ore for atomic energy defense activities of the United States from 1947 to 1970. To help quantify this remnant risk, the U.S. Department of Energy (DOE) Office of Legacy Management (LM) was authorized to initiate the Defense-Related Uranium Mines (DRUM) Program in fiscal year (FY) 2017. DOE subsequently established a five-year campaign to carry out verification and validation (V&V) field work at approximately 2,500 legacy mines located on public land. Most of this land is managed by the U.S. Forest Service (USFS), the U.S. Bureau of Land Management (BLM), or the U.S. National Park Service (NPS) for multiple uses, but primarily public recreation. This midyear report describes DRUM Program accomplishments and achievements for the reporting period of Jan. 1 through June 30, 2021. The report also provides information regarding progress on Campaign 1 (public land) and overall program progress since its initiation in July 2017. This additional information provides context for the reporting period accomplishments.

DRUM Progress Summary

The DRUM Program's fifth field season began on March 8, 2021, and the primary focus has been on BLM-managed land in Southwest Colorado with a high density of mines. During the reporting period, 255 field V&V mine visits have been completed. Field V&V work has been completed at a total of 1,539 mines by the program to date, with 1,314 conducted at mines on public land (Campaign 1). LM has completed 184 mine-specific final V&V reports during the reporting period. Cumulatively, LM has completed 1,318 final V&V reports, of which 1,105 are for mines on public land, 172 are for mines on mixed-ownership land, 40 are for mines on state-managed land, and one on private property (this mine changed from the state-managed land to private after the report was final). All reports from the 2020 field season and all prior field seasons have been finalized.

The DRUM Program supports LM's strategic goal of "protecting human health and the environment" (Goal 1), and its strategic objective to "address the environmental legacy of defense-related uranium mining and milling sites" (DOE 2020a).

Significant DRUM Program accomplishments during the reporting period include:

- Prepared a roll-up document of risk rankings for the mines within each of the following completed V&V project areas (sorted by federal land management agency):
 - o Northeastern South San Rafael Locality (32 mines) in eastern Utah on BLM-administered land.
 - o Upper Kane Creek, Lower Kane Creek, Cane Canyon, Brumley Ridge Localities (18 mines) in eastern Utah on BLM-administered land.
 - o Seven Mile Canyon, Klondike Ridge, Courthouse Wash, and Richardson Localities (17 mines) in eastern Utah on BLM-administered land.
 - o Northern Trachyte and Orange Cliffs Localities (24 mines) in central Utah on BLM-administered land.
 - o Southern Trachyte Locality (33 mines) in central Utah on BLM-administered land.
 - o Atkinson Mesa and Mesa Creek Localities (15 mines) in western Colorado on BLM-administered land.

- o Additional mines in Long Park and Adjacent Localities (22 mines) in western Colorado on BLM-administered land.
- o East Calamity Mesa Locality (32 mines) in western Colorado on BLM-administered land and Uranium Lease Program land.
- o West Calamity Mesa Locality (22 mines) in western Colorado on BLM-administered land and Uranium Lease Program land.
- o Outlaw Mesa Locality (34 mines) in western Colorado on BLM-administered land and Uranium Lease Program land.
- o East Yellow Cat Locality (32 mines) in eastern Utah on BLM-administered land.
- o Fry Canyon Locality (8 mines) in southeastern Utah on BLM-administered land.
- o West Yellow Cat Locality (27 mines) in eastern Utah on BLM-administered land.
- o Big Pinto-Blue Chief, Buckhorn Mesa-Scharf Mesa, and Dewey Bridge-Squaw Park Localities (12 mines) in eastern Utah on BLM-administered land.
- o Beaver Mesa Locality (26 mines) in western Colorado on BLM-administered land.
- o Swazys Flat and Temple Mountain Localities (38 mines) in eastern Utah on BLM-administered land.
- o Southwestern South San Rafael (27 mines) in southeastern Utah on BLM-administered land.
- Prepared or revised Field Operations Plans that describe reconciled mine locations and provide guidance for a logical approach to field V&V work in specific geographic areas including:
 - o Northern Region of the Slick Rock Mining District in Colorado (102 mines).
 - o Gypsum Valley Mining District in Colorado (92 mines).
 - o Green River Mining District in Utah (22 mines).
 - o Southern Region of the Slick Rock Mining District in Colorado (130 mines).
- Participated in a meeting with Western Colorado University on Jan. 21, 2021, regarding reclamation research opportunities at DRUM sites.
- Conducted training during the winter months for DRUM personnel to prepare for the 2021 field season.
- Presented information on DRUM to the Nuclear Energy Tribal Working Group.
- Participated in several meetings and coordination activities with the National Nuclear Security Administration's Aerial Measuring System team to conduct aerial gamma radiation surveys of very large DRUM sites in Wyoming; this work is planned for August 2021.
- Published the *Defense-Related Uranium Mines Annual Report*, Jan. 1 through Dec. 31, 2020 (DOE 2021), providing details on 2020 program activities and accomplishments, project planning for 2021, and an updated program timeline.
- Completed *Defense-Related Uranium Mines (DRUM) Safeguarding Program Management Plan* (LMS/DRM/S33217-0.1) providing the structure and basis for the management of safeguarding, monitoring, and maintenance of hazardous mining-related features at DRUM sites.

- Updated the *Defense-Related Uranium Mines Verification and Validation Work Plan* (DOE 2021b) to incorporate operational experiences (common deviation requests) from the 2020 field season and streamlined field processes for the 2021 field season.
- Hosted three Abandoned Uranium Mines Working Group (AUMWG) conference call meetings (January, March, and June). Information regarding partner agency planned activities, including future DRUM Program direction, and ongoing V&V program, and recent and future hazardous mine feature safeguarding activities, was shared between the participants.
- Worked with Navajo Abandoned Mine Lands (AML), Navajo Environmental Protection Agency, and U.S. Environmental Protection Agency (EPA) Region 9 to provide a chapter on the DRUM program in EPA's Ten-Year Plan, identifying the next steps in addressing the human health and environmental risks associated with the legacy of uranium mining and milling on the Navajo Nation.
- Conducted NEPA Categorical Exclusion Evaluation to conduct safeguarding, monitoring, and maintenance activities on DRUM sites on federal, state, tribal AML in accordance with the DRUM Safeguarding Program Management Plan.
- Presented aerial gamma survey plans of large mines in Wyoming at the International Atomic Energy Agency's (IAEA) Annual Meeting of the Coordination Group of Uranium Legacy Sites (known as CGULS). Helped them to better understand what activities may be necessary at abandoned mine sites in the former Soviet Central Asian Republics of Tajikistan, Kyrgyzstan, and Uzbekistan. There was strong interest in our program and the information and methods presented, particularly the reference to collaboration and partnerships between multiple government agencies with responsibility for reclamation and related activities.
- Completed 169 mine reconciliations, 255 V&V field visits and 184 final reports including those on public land.

In 2021, DRUM is focused on completing V&V in mining districts in Colorado (particularly in BLM's Tres Rios Field Office area, which is in the southwest portion of the state) and Utah, where the highest remaining concentration of DRUM is located. This strategy is similar to the 2020 field work season, which focused mostly on visiting mines in Colorado and Utah to complete V&V operations in areas with a high density of mines. This focus also aligns with LM's COVID-19 restrictions, which limited travel to the Grand Junction region. Partnerships and interagency agreements (IAA) with BLM and NPS were previously completed and were updated to support their continued program collaboration and allow for DRUM-related expenditures by those agencies. A funded IAA with the USFS's AML program was established with their headquarters office to better facilitate mutual safeguarding objectives while previous IAAs with regional USFS engineering divisions were terminated to optimize collaboration and safeguarding efforts. As the initial IAA with the BLM's national office is due to expire, a new IAA with the BLM national office is being pursued to encompass V&V and safeguarding activities. LM is initiating a cooperative agreement with Navajo Nation's AML program to facilitate upcoming V&V and safeguarding efforts on their land.

LM and partner agencies are prioritizing safeguarding physical hazards (primarily mine entries) identified by the DRUM Program. LM teams with partner agencies; state and tribal AML programs; and Bat Conservation International (BCI), a non-profit, to safeguard DRUM sites. LM provides funding to allow partners to complete these safeguarding projects; five projects in Utah and four in Colorado were recently completed using this model.

Finally, LM initiated discussions with several EPA regional offices regarding the next campaign to verify and validate abandoned uranium mines on tribal lands. The specific methodologies of the campaign will be developed in consultation with tribal AML programs and the EPA. The DRUM sites are primarily on Navajo Nation land (96 percent) and are unique when compared to mines situated on public land since tribal members often live on or near DRUM sites. In addition to Navajo land, mines (14 in total) are located on seven other Indian Reservations.

DRUM Return on Investment

The Report to Congress identified 4,225 potential mines on federal, state, tribal, and private land. Of these, the report estimated that 2,500 mines were on public land. Although the total potential liabilities are not explicitly spelled out, the report estimated that 80 percent of these mines would require safeguarding (referred to as “reclamation” in the report) and 20 percent would require environmental remediation work. Safeguarding involves mitigating mining-related physical hazards, generally by constructing barriers to human access at the entries to underground mines. Reclamation is the process of restoring essential geomorphic functions at previously mined locations. This process may include recontouring waste rock piles and other mining-related disturbances to minimize erosion potential and blend the mine site with the adjacent undisturbed landscape. Remediation of abandoned uranium mines typically involves isolating contaminants or pollutants from the surrounding environment, generally by consolidating waste materials and performing environmental restoration work.

The Report to Congress estimated that mines that exhibit threats to human safety would require an average of three safeguards each at an estimated cost of \$18,000 per constructed safeguard, or an average unit cost of \$54,000 per affected mine. The Report to Congress estimated that the mines that require remediation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to alleviate environmental concerns may require an average unit cost of \$1,300,000 per mine. The estimated cost to remediate mines was calculated using data from Table 4 in the *Defense-Related Uranium Mines Cost and Feasibility Topic Report* (DOE 2014b). The maximum remediation cost for each mine size category was multiplied by the percentage of mines in that size category to derive the estimated cost per mine of \$1,300,000 (rounded).

Applying the unit cost estimate from the Report to Congress for safeguarding a physical hazard to the estimated total number of DRUM on public land suggests a total safeguarding cost of \$108,000,000. Applying the unit cost estimate from the Report to Congress for remediation work to the total estimated number of DRUM on public land suggested a possible remediation cost of \$650,000,000. Implementation of the current DRUM campaign, V&V work at mines on public land, and the screening of these mines for potential risks to human health and safety have allowed the program to substantially reduce these potential cost estimates.

The DRUM Program reduces potential costs and liabilities in two ways: (1) removing duplicate mining records from the DRUM Program database, thereby decreasing the estimated total number of existing mines; and (2) applying risk screening results to refine the estimated amount of physical and environmental risks based on observed conditions at the mines. To date, 1,126 duplicate records have been removed from the database, clarifying the actual number of existing mines, eliminating potential risk associated with the mines removed from the database, and decreasing the overall estimated potential risks.

Following reconciliation, the number of mines in the DRUM Program database at the end of the reporting period shows that 1,959 mines are on public land (Campaign 1). This number will fluctuate until the public land campaign is completed. Analysis of site risk screening evaluations completed to date shows that approximately 62 percent of mines will require safeguarding for physical hazards compared to the 80 percent estimated in the Report to Congress. The Report to Congress estimated that an average of three safeguards per mine would be required at mines where hazardous entries were identified. DRUM Program field inventory information appears to generally validate this assumption. These updated estimates result in a safeguarding cost reduction of approximately \$42,390,000 (Table 1).

DRUM field work completed to date suggests that approximately 12 percent of the mines could require further analysis via the CERCLA process. When implemented, the CERCLA process will be handled by the appropriate land management agencies. This is a smaller population of mines than the 20 percent, which had been estimated in the Report to Congress. If this trend continues, the resulting potential remediation scope will be reduced from about 500 mines (the Report to Congress estimate) to about 235 mines, representing a reduction in potential cost of approximately \$344,500,000 (Table 1). The total projected program expenditure of \$29,000,000 (an average of \$5,800,000/year for five years) has the potential to reduce cost projections by an estimated \$319,500,000, a return on investment of roughly 11:1.

Table 1. Estimated Versus Projected DRUM Actions and Expenditures at Mines on Public Land

	Report to Congress Estimates	Program Estimates as of June 30, 2021	Difference
Number of mines	2,500	1,959	541 mines
Estimated number of mines to safeguard	2,000 ^a	1,215 ^b	785 mines
Estimated cost to complete safeguards ^c	\$108,000,000 ^a	\$65,610,000 ^b	\$42,390,000
Estimated number CERCLA eligible mines	500 ^a	235 ^b	265 mines
Estimated cost to complete CERCLA remediation ^d	\$650,000,000 ^a	\$305,500,000 ^b	\$344,500,000

Notes:

^a Estimates based on Report to Congress population of 2,500 mines.

^b Estimates based on population of 1959 mines.

^c Safeguard construction estimated at \$54,000 per mine.

^d CERCLA remediation costs estimated at \$1,300,000 per mine.

V&V Progress

The DRUM Program will complete most V&V field work at mines on public land by the close of FY 2022 (Sep. 30, 2022). V&V activity consists of: (1) a reconciliation step completed in the office to confirm land status, location, and ore purchase data for each mine and to remove duplicate purchase records from the database; (2) an inventory step to confirm the mine location in the field and to gather information regarding mine features and their potential hazards; (3) an environmental sampling step to collect chemical, radiological, and ecological data; and (4) a report preparation step. Field V&V work is completed after inventory and environmental sampling are complete or after inventory is complete for mines that do not require sampling. Draft and final reports are prepared for each mine following completion of V&V activities. Draft reports are

generally submitted 120 days after V&V is completed with final reports being prepared once LM reviews and accepts the draft reports. Merged duplicates are documented on a certificate, and V&V activity is considered completed once the certificate is produced.

During this reporting period, 237 V&V field visits have been completed on public land and 162 final reports prepared (Table 2). Cumulatively, V&V has been completed at 1,314 mines on public land, and 1,126 duplicate records have been removed. Cumulatively, 1,105 final reports for mines on public land have been completed (Table 3). Draft reports have been completed for V&V completed last field season; draft reports representing 2021 field visits are currently in production.

Table 2. V&V Progress on Public Land for the Period Jan. 1-June 30, 2021^a

Land Management Agency	Reconciliation Completed	Inventory Completed	Environmental Sampling Completed	Total V&V Complete	Number Final Reports
BLM	47	211 ^b	230	230	160
USFS	5	7	7	7	2
NPS	4	0	0	0	0
U.S. Bureau of Reclamation	1	0	0	0	0
U.S. Fish and Wildlife Service	0	0	0	0	0
U.S. Department of Defense	0	0	0	0	0
Duplicates	30				
	87	218	237	237	162

^aThe data presented in this table are for mines managed by only one federal agency. There are also mines that have mixed ownership where the mine is managed or owned by more than one organization or individual (private property). For this reporting period, 17 mixed ownership mines had V&V completed for the public land portion, and 13 final reports were completed for the public land component.

^bIn addition to these mines, there were 19 mines that were originally inventoried by the Utah Abandoned Mine Reclamation Program in 2019. The features identified during the original inventory were confirmed during the DRUM V&V visit, which is when the environmental sampling was also completed.

Table 3. Cumulative V&V Progress on Public Land Through June 30, 2021^a

Land Management Agency	Reconciliation Completed	Inventory Completed	Environmental Sampling Completed	Total V&V Completed ^b	% V&V Completed ^c	Mines Remaining to V&V	Final Reports Completed	% Final Reports Completed ^e
BLM	1,572	1,144	1,140	1,143	73%	441	939	82%
USFS	326	172	161	168	51%	160	163	97%
NPS	40	0	0	0	0%	40	0	NA
U.S. Bureau of Reclamation	4	0	0	0	0%	4	0	NA
U.S. Fish and Wildlife Service	2	2	2	2	100%	0	2	100%
U.S. Department of Defense	1	1	1	1	100%	0	1	100%
Duplicates	1,126							
	3,071	1,319	1,304	1,314		645	1,105	

Notes:

^a The data presented in this table are for mines managed by only one federal agency. There are also mines that have mixed ownership where the mine is managed or owned by more than one organization or individual (private property). To date, 180 mixed-ownership mines have had V&V complete for the public land portion, and 172 final reports were completed for the public land component.

^b Total V&V completed includes all mines visited where environmental sampling was completed and mines field visited but where no environmental sampling was required (e.g., previously remediated mines or mine locations where there was no evidence of mining operations).

^c Percent V&V completed is based on number of mines out of those that have been reconciled where all V&V work is complete.

^d Mines remaining to V&V is the total number of reconciled and unreconciled mines that have not been field verified or removed as duplicates from the database.

^e Percent final reports completed is based on the number of mines out of those where all V&V work is complete for which final V&V reports have been produced.

Abbreviation:

NA = not applicable

Accounting for the Total Number of DRUM Program Mines

The primary sources for estimating the potential number of mines in the DRUM Program are U.S. Atomic Energy Commission ore-purchase records. The Report to Congress identified 4,225 mines from these records, counting each purchase record as an individual mine. The estimated total number of mines changes as more information is obtained. The DRUM Program has confirmed that duplicate (two or more) purchase records exist for many mines, resulting in an overestimation of the total number of mines. Aside from merging duplicate records, the team occasionally discovers additional previously unreported purchase records that are added to the total number of mines.

The current accounting of mines in the DRUM Program database for all types of land ownership is:

$$4,225 \text{ (Report to Congress)} - 1,126 \text{ (duplicates)} - 8 \text{ (deleted records)} + 334 \text{ (added records)} \\ = 3,425 \text{ mines currently in the database}$$

Additional V&V Progress – The Bigger Picture

The reconciliation process is conducted geographically based on mining district or land management agency boundaries. All mines in a geographic area are reconciled regardless of land ownership, leading to overall program efficiency as Campaign 2 (DRUM Program mines on tribal land) and Campaign 3 (DRUM Program mines on private property) are initiated. Table 4 and Table 5 present the V&V progress made so far for mines in each land ownership category. Including all mines, regardless of ownership, not only improves the efficiency of the reconciliation effort, but also ensures that all the mines are properly identified, and that land ownership is confirmed.

As part of the public land campaign, LM developed relationships and cooperative agreements with state AML programs in Colorado and Utah and with BLM in New Mexico to assist in performing the inventory task of V&V work. LM leveraged the state agencies' authority to inventory mines on state and private land because some mines are situated on both federal and private or state land. By using this cooperative approach to gain additional inventory information during the public land campaign, LM efficiently improves completeness of the DRUM location data and is better positioned to develop and implement mixed-ownership sites of Campaigns 2 and 3.

Table 4. Bigger Picture V&V Progress for the Period Jan. 1-June 30, 2021

Land Management Agency	Reconciliation Completed	Inventory Completed	Environmental Sampling Completed	Total V&V ^a Completed
Federal land management agencies	57	218	237	237
Private	6	0	0	0
Mixed	1	16	16	17
State	6	0	1	1
U.S. Bureau of Indian Affairs	97	0	0	0
Unknown	2	0	0	0
Merged duplicates	30			
Total	199	234	254	255

Notes:

^a Total V&V complete includes all mines visited where environmental sampling was completed, and mines field visited but where no environmental sampling was required (e.g., previously remediated mines or mine locations where there was no evidence of mining operations).

Table 5. Bigger Picture Cumulative V&V Progress Through June 30, 2021

Land Management Agency	Reconciliation Completed	Inventory Completed	Environmental Sampling Completed	Total V&V Completed ^a	Mines Remaining to V&V ^b	Mines Completed-V&V ^c
Federal land management agencies	1,945	1,319	1,304	1,314	645	67%
Private	556	176	3	4	552	1%
Mixed	321	183	178	180	141	56%
State	91	45	41	41	50	45%
U.S. Bureau of Indian Affairs	352	0	0	0	353	0%
Unknown	2	0	0	0	145	0%
Merged duplicates	1,126					
Total	4,393	1,723	1,526	1,539	1,886	45%

Notes:

^aTotal V&V complete includes all mines visited where environmental sampling was completed and mines field visited but where no environmental sampling was required (e.g., previously remediated mines or mine locations where there was no evidence of operations).

^bMines remaining to V&V is the total number of reconciled and unreconciled mines that have not been field verified or removed as duplicates from the database.

^cCalculated by comparing the number of mines where V&V work is completed to the total estimated number of mines (those completed plus those remaining to V&V).

Physical Hazards

Physical hazards are mining-related features that pose potential harm to human health or safety and are recognized as the primary risk at DRUM sites. Physical mining-related features that pose threats to human safety include open vertical mine entries (shafts, some vents, and subsidence features) as well as horizontal mine entries (adits and declines). In some instances, a remnant topographic surface feature, such as a hazardous highwall, may pose a threat to human health. To protect the well-being of members of the public who visit DRUM sites, LM is teaming with partner land management and state AML agencies to construct safeguards at hazardous mine features. These safeguards will prevent human ingress to abandoned mines, while honoring the cultural and ecological value of the mines and their environments.

As the DRUM Program has evolved, it has become apparent that partner land management agencies prefer to safeguard most open mine entries rather than only high-hazard mine entries. Safeguarding the majority of open mine entries in a specific area during a single mobilization is a more cost-effective and time-efficient means of completing this work.

Cumulatively, DRUM identified approximately 3,292 hazardous mine features at 856 mines, which may require safeguarding. Table 6 shows the number of mines with physical hazards by state and the estimated total cost of safeguarding. The estimated cost of constructing mine safeguards may be reevaluated following completion of additional mine safeguard projects.

Table 6. Mines with Potential for Safeguarding, Cumulative Through June 30, 2021^a

State	Mines Risk Screened ^a	Mines with Physical Hazards	Potential Features for Safeguarding	Total Costs for Safeguarding (\$ millions) ^b
Colorado	513	277	984	\$17.71
New Mexico	60	29	48	\$0.86
South Dakota	26	17	62	\$1.12
Utah	742	517	2,174	\$39.13
Wyoming	38	16	24	\$0.43
Total	1,379	856	3,292	\$59.25

Notes:

^a This includes all mines at which V&V work has been completed, regardless of land management or ownership status.

^b Total costs were calculated using the figure of \$18,000 multiplied by the number of potential features to be safeguarded.

LM has expanded its safeguarding assistance with partner agencies, through existing agreements, to promote collaboration of safeguarding physical hazards identified by the DRUM Program. In addition to using the agreements with land management agencies and state AML programs, LM is using a financial agreement with BCI to bolster the overall safeguarding capacity of the program. In 2020, LM completed seven safeguarding projects on BLM land in Utah and Colorado. In addition, LM anticipates increasing the number of safeguarding projects with partner agencies in future years. LM anticipates funding and scope in existing cooperative agreements will be maintained to provide for future completion of safeguarding work. Lessons learned from these experiences helped formulate a safeguard program management plan that was completed in March 2021. Most importantly, there are six more safeguarding projects planned for 2021 in Colorado, Utah, and New Mexico. These projects will safeguard 135 hazardous mining-related features on DRUM sites.

Human Health Risk and CERCLA Potential

The number of mines that could potentially move from the DRUM Program screening process to a CERCLA process is much lower than the number of mines that will require safeguarding of physical hazards. Land management agencies utilize their authority under CERCLA to address releases, or potential releases, of hazardous substances. Mines with a “high” or “medium” score for chemical or radiological risks could be further investigated by the land management agencies, potentially leading to CERCLA response actions. Of the 1,379 mines that have been risk screened to date, approximately 170 mines (12 percent) could require further analysis via the CERCLA process. However, the DRUM Program can further refine this assessment with the application of modifying factors. Applying a potential outcome of only mines that rank “high” for suitability for camping and a rank of “high” or “medium” for ease of access (risk modifying factors) would potentially

enhance the CERCLA evaluation and reduce the population of mines potentially requiring future remediation; if these assumptions for the suitability and access modifying factors are applied, it reduces the number of mines that could require further analysis via the CERCLA process to 3 percent. LM will collaborate with the respective land management agencies for concurrence on the safeguarding priorities and planning, but CERCLA determinations are at the discretion of the land agencies. Table 7 shows the mines with a “high” or “medium” risk ranking for chemical or radiological hazards without applying the above-mentioned modifying factors and the potential costs.

*Table 7. Mines That Are Potential Candidates for Remediation (CERCLA)
Actions Cumulative, Through June 30, 2021*

State	Mines Risk Screened	High Chemical Risk Rank	Medium Chemical Risk Rank	High Radiological Risk Rank	Medium Radiological Risk Rank	Potential CERCLA (Remediation Process) ^a	Potential CERCLA (Remediation) Costs (\$ million) ^{b, c}
Colorado	513	9	29	0	9	45	\$59
New Mexico	60	0	3	0	0	3	\$4
South Dakota	26	0	0	0	0	0	\$0
Utah	742	6	97	0	20	118	\$153
Wyoming	38	0	3	0	1	4	\$5
Total	1,379	15	132	0	30	170	\$221

Notes:

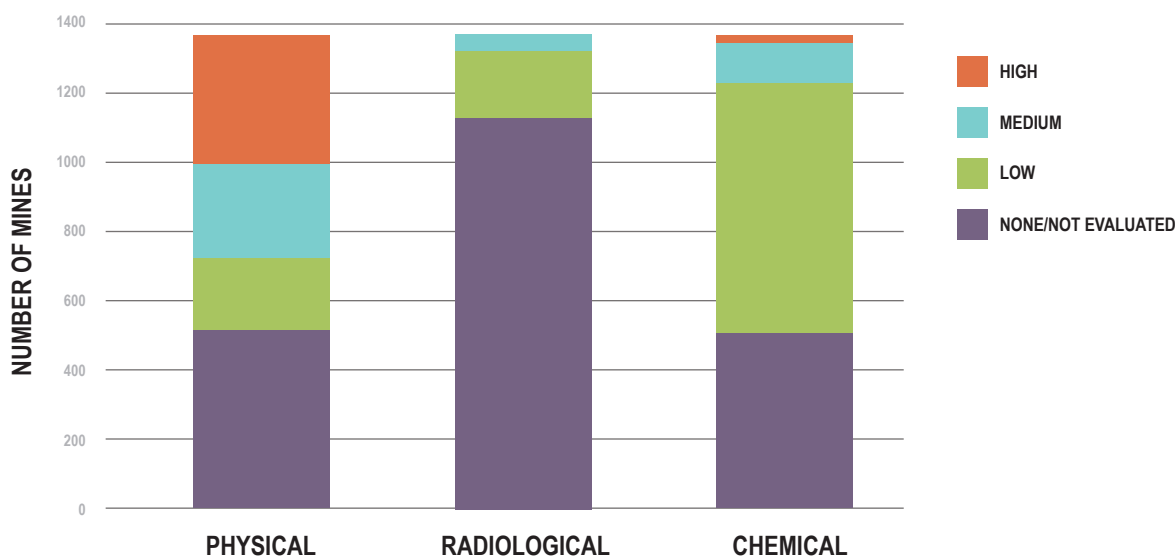
^aSeven mines had more than one elevated risk ranking (e.g., a medium chemical risk rank and a medium radiological risk rank at the same mine). Since one CERCLA action would address any elevated risk ranks at the same mine, these were subtracted from this column to avoid double counting.

^bThe potential CERCLA cost of \$1.3 million per remediated mine was calculated using data from Table 4 in the DRUM Cost and Feasibility Topic Report.

^cStarting in March 2020, LM began evaluating Ra-226 on a separate risk track. As of June 30, 2021, this has been completed for 203 mines in Colorado and 280 mines in Utah; this has not been done for mines in any other state. If the elevated risk rankings for Ra-226 could result in a potential CERCLA action, this could result in an additional 22 mines and 12 mines in Colorado and Utah, respectively (mines that already had elevated rankings for chemical or radiological risks were not included in these estimates). If these were added, the potential CERCLA mines would be 204 (15%), with a potential cost of approximately \$265 million.

Figure 1 below illustrates the rankings of mines for physical, radiological, and chemical risks. While “high,” “medium,” and “low” physical hazards could be considered for safeguarding activities (“low” hazards (e.g., a prospect) are not always addressed, but they are often safeguarded when equipment is on site for other higher priority mine features), only mines with “high” or “medium” radiological and chemical risks may be considered for estimating the costs of future remedial (CERCLA) work. Seven mines were observed to exhibit a “high” or “medium” chemical risk and a “medium” radiological risk. Mines that exhibit both elevated chemical and radiological risks would be addressed currently during a single remediation construction event. To avoid overestimating the potential number remediations that may be considered, the seven mines exhibiting dual risk factors were each considered as a single remediation event. As a result, 170 mines may be considered for future remedial (CERCLA) work.

Figure 1. Mine Physical, Radiological, and Chemical Risk Rankings



Agency Concurrence

The DRUM Program continues to work collaboratively with partners for the successful implementation of the DRUM Program and the identification of physical hazards. The concurrence of those features that need to be safeguarded allows LM and partner agencies to initiate hazardous mine feature safeguarding projects. Therefore, concurrence is an important tool in safeguarding the public and wildlife from the inherent physical dangers posed by open mine features.

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Defense-Related Uranium Mines (DRUM) Safeguarding Program Management Plan LMS/DRM/S33217-0.1

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